Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 (currently amended). A surface plasmon resonance sensor for sensing the refractive index of a probe region comprising:

a polychromatic light source for generating light propagating along an incident light propagation axis;

a polarizer in optical communication with said polychromatic light source for selecting the polarization state of said light;

an optical assembly in optical communication with said polychromatic light source, said optical assembly comprising a dielectric layer, a dielectric sample layer and a conducting layer positioned between said dielectric layer and said dielectric sample layer, wherein illumination of said optical assembly with said light generates light propagating along a reflected light propagation axis, wherein a portion of said dielectric sample layer adjacent to said conducting film comprises the probe region;

a detector in optical communication with said optical assembly for detecting said light propagating along said reflected light axis, thereby sensing the refractive index of said probe region; and

a selectably adjustable wavelength selector positioned in the optical path between said light source and said detector for transmitting

light having a distribution of transmitted wavelengths selected to generate surface plasmons on a surface of said conducting layer in contact with said dielectric sample layer, wherein the distribution of transmitted wavelengths is continuously tunable by adjustment of the selectably adjustable wavelength selector.

2. (original) The surface plasmon resonance sensor of claim 1 further comprising a light collection and focusing element positioned between said optical assembly and said detector, said light collection and focusing element for collecting said light propagating along the reflected light propagation axis and focusing light propagating along the reflected light propagation axis onto said detector.

3. (original) The surface plasmon resonance sensor of claim 1 further comprising a collimating optical element for collimating light from said polychromatic light source, wherein said collimating optical element is positioned between said polychromatic light element and said optical assembly.

4. (original) The surface plasmon resonance sensor of claim 3 where said collimating optical element comprises a first lens, a pinhole, and a second lens each positioned between said polychromatic light source and said optical assembly.

5. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector is positioned between said optical assembly and said detector.

6. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector is positioned between said polychromatic light source and said optical assembly.

7. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector is an optical interference filter.

8. (original) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter is a Fabry-Perot etalon.

9. (original) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter is a linear variable interference filter.

10. (currently amended) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter is rotationally adjustable about an axis which is orthogonal to said incident light propagation axis, wherein rotation of said optical interference filter selectably adjusts the <u>tilt angle and</u> distribution of transmitted wavelengths <u>of said optical interference filter</u>.

11. (original) The surface plasmon resonance sensor of claim 10 wherein rotation of said optical interference filter selectably adjusts the center wavelength of the distribution of transmitted wavelengths.

12. (original) The surface plasmon resonance sensor of claim 11 wherein said center wavelength of the distribution of transmitted wavelengths is provided by the equation:

$$\lambda_{center}\left(\theta_{tilt}\right) = \left(\lambda_{center}(0)\right)\left(1 - \left(\frac{\sin^2\theta_{tilt}}{n^2}\right)\right)^{0.5}$$

wherein λ_{center} is said center wavelength of the distribution of transmitted wavelengths, θ_{tilt} is a tilt angle, $\lambda_{center}(0)$ is a center wavelength at normal incidence with respect to the reflected or incident light propagation axes and n is the refractive index of the optical interference filter.

13. (currently amended) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter is rotationally adjustable about an axis which is orthogonal to said reflected light propagation axis, wherein rotation of said optical interference filter selectably adjusts the <u>tilt angle and</u> distribution of transmitted wavelengths <u>of said optical interference filter</u>.

14. (original) The surface plasmon resonance sensor of claim 13 wherein rotation of said optical interference filter selectably adjusts the center wavelength of the distribution of transmitted wavelengths.

15. (original) The surface plasmon resonance sensor of claim 14 wherein said center wavelength of the distribution of transmitted wavelengths is provided by the equation:

$$\lambda_{center}\left(\theta_{tilt}\right) = \left(\lambda_{center}(0)\right)\left(1 - \left(\frac{\sin^2\theta_{tilt}}{n^2}\right)\right)^{0.5}$$

wherein λ_{center} is said center wavelength of the distribution of transmitted wavelengths, θ_{tilt} is a tilt angle, $\lambda_{center}(0)$ is a center wavelength at normal incidence with respect to the reflected or incident light propagation axes and n is the refractive index of the optical interference filter.

16. (currently amended) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter is rotationally adjustable about an axis which is orthogonal to said incident light propagation axis, wherein rotation of said optical interference filter selectably adjusts the distribution of wavelengths that are substantially prevented from transmitting through said optical interference filter.

17. (currently amended) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter is rotationally adjustable about an axis which is orthogonal to said reflected light propagation axis, wherein rotation of said optical interference filter selectably adjusts the distribution of wavelengths that are substantially prevented from transmitting through said optical interference filter.

18. (original) The surface plasmon resonance sensor of claim 7 wherein said optical interference filter has first and second substantially parallel ends and said first end has a tilt angle selected over the range of 0° to about 35°.

19. (original) The surface plasmon resonance sensor of claim 1 wherein said distribution of transmitted wavelengths is characterized by a center wavelength and said center wavelength is tunable over a range of about 65 nm.

20. (original) The surface plasmon resonance sensor of claim 1 wherein said distribution of transmitted wavelengths is characterized by a bandwidth and said band width has a value selected from the range of about 1 nm to about 100 nm.

21. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector comprises a monochromator.

22. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector comprises a spectrometer.

23. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector comprises a prism.

24. (original) The surface plasmon resonance sensor of claim 1 wherein said selectably adjustable wavelength selector comprises a grating.

25. (original) The surface plasmon resonance sensor of claim 1 wherein said detector is a charge coupled device.

26. (original) The surface plasmon resonance sensor of claim 1 wherein said dielectric layer has a first refractive index, wherein said dielectric sample layer has a second refractive index which is less than said first refractive index and wherein said light propagating along said incident light propagation axis undergoes total internal reflection upon interaction with said optical assembly.

27. (original) The surface plasmon resonance sensor of claim 1 wherein said dielectric layer is a prism.

28. (original) The surface plasmon resonance sensor of claim 1 further comprising a flow cell operationally connected to said optical assembly for introducing a sample into said probe region.

29. (original) The surface plasmon resonance sensor of claim 28 wherein said dielectric sample layer is a sample provided by said flow cell.

30. (original) The surface plasmon resonance sensor of claim 1 wherein said conducting layer comprises a gold film.

31. (currently amended) The surface plasmon resonance sensor of claim 1 wherein said dielectric ~~first refractive index~~ layer and said conducting layer ~~comprise~~ are components of a waveguide.

32. (currently amended) The surface plasmon resonance sensor of claim 1 wherein said dielectric ~~first refractive index~~ layer and said conducting layer ~~comprise~~ are components of an optical fiber.

33. (original) The surface plasmon resonance sensor of claim 1 comprising a surface plasmon imaging device.

34. (original) The surface plasmon resonance sensor of claim 1 wherein said light source is an incoherent light source.

35. (original) The surface plasmon resonance sensor of claim 1 further comprising a microfluidic flow cell operationally connected to said optical assembly for introducing a sample into said probe region.

36. (currently amended) The surface plasmon resonance sensor of claim 35 wherein said surface of said conducting layer in contact with said ~~second~~ dielectric sample layer comprises a side of said microfluidic flow cell.

37. (original) The surface plasmon resonance sensor of claim 1 wherein said surface of said conducting layer is modified to provide for selective binding affinity.

38. (original) The surface plasmon resonance sensor of claim 1 wherein said surface of said conducting layer in contact with said dielectric sample layer is modified to provide for selective adsorption characteristics.

39. (currently amended) A method of sensing the refractive index of a probe region comprising the steps of:

passing light from a polychromatic light source through a polarizer, thereby generating light propagating along an incident light propagation axis;

directing said light onto an optical assembly, said optical assembly comprising a dielectric layer, a dielectric sample layer and a conducting layer positioned between said dielectric layer and said dielectric sample layer, thereby generating light propagating along a reflected light propagation axis, wherein a portion of said dielectric sample layer adjacent to said conducting layer comprises said probe region;

passing said light through a selectably adjustable wavelength selector positioned in the optical path between said light source and a detector, wherein light having a distribution of transmitted

wavelengths is transmitted through said selectably adjustable wavelength selector;

detecting said light having said distribution of transmitted wavelengths with said detector~~, thereby sensing said refractive index of said probe region~~, and

tuning the center wavelength of said distribution of transmitted wavelengths by adjusting said selectably adjustable wavelength selector to transmit light having a continuously tunable distribution of wavelengths ~~selected to~~ that generates surface plasmons on a surface of said conducting layer in contact with said dielectric sample layer, thereby sensing said refractive index of said probe region.

40. (original) The method of claim 39 wherein said adjusting step comprises the step of systematically varying said distribution of wavelengths transmitted by said selectably adjustable wavelength selector.

41. (original) The method of claim 39 wherein said adjusting step comprises the steps of:

transmitting light through said selectably adjustable wavelength selector having a first distribution of wavelengths, thereby generating a first image of said probe region;

transmitting light through said selectably adjustable wavelength selector having a second distribution of wavelengths, thereby generating a second image of said probe region;

comparing the spectral quality of said first and second images; and

selecting a distribution of wavelengths of said incident light which are transmitted by said selectably adjustable wavelength selector to enhance the spectral quality of said image.

42. (original) The method of claim 39 wherein said selectably adjustable wavelength selector is positioned between said light source and said optical assembly.

43. original) The method of claim 39 wherein said selectably adjustable wavelength selector is positioned between said optical assembly and said detector.

44. (original) The method of claim 39 wherein said selectably adjustable wavelength selector is an optical interference filter.

45. (original) The method of claim 44 wherein said optical interference filter is a Fabry-Perot etalon.

46. (currently amended) The method of claim 44 wherein said adjusting step comprises the step of rotating said optical interference filter about an axis which is orthogonal to said incident light propagation axis, wherein rotation of said optical interference filter selectably adjusts <u>the tilt angle of said interference filter and the </u>distribution of wavelengths of light which are transmitted <u>by said interference filter</u>.

47. (currently amended) The method of claim 44 wherein said adjusting step comprises the step of rotating said optical interference filter about an axis which is orthogonal to said reflected light propagation axis, wherein

rotation of said optical interference filter selectably adjusts the tilt angle of said interference filter and the distribution of wavelengths of light which are transmitted by said interference filter.

48. (currently amended) The method of claim 44 wherein said adjusting step comprises the step of rotating said optical interference filter about an axis which is orthogonal to said incident light propagation axis, wherein rotation of said optical interference filter selectably adjusts the tilt angle of said interference filter and the distribution of wavelengths that are substantially prevented from transmitting through said optical interference filter.

49. (currently amended) The method of claim 44 wherein said adjusting step comprises the step of rotating said optical interference filter about an axis which is orthogonal to said reflected light propagation axis, wherein rotation of said optical interference filter selectably adjusts the tilt angle of said interference filter and the distribution of wavelengths that are substantially prevented from transmitting through said optical interference filter.

50. (original) The method of claim 39 wherein said step of passing light through a polarizer generates light having a p-polarization state propagating along said incident light propagation axis.

51. (original) The method of claim 39 where said light propagating along said incident light propagation axis undergoes total internal reflection upon interaction with said optical assembly.

52. (original) The method of claim 39 further comprising the step of collimating light from said polychromatic optical source.

53. (original) The method claim 39 further comprising the step of focusing said light propagating along said reflected light propagation axis onto said detector.

54. (original) The method of claim 39 wherein said light has wavelengths in the near infrared region of the electromagnetic spectrum.

55. (original) The method of claim 39 wherein said optical assembly further comprises a flow cell operationally connected to said probe region for delivering chemical species into said probe region.

56. (original) The method of claim 55 further comprising the step of flowing chemical species through said flow cell, thereby changing the composition of said probe region.

57. (original) The method of claim 55 further comprising the step of flowing chemical species through said flow cell, thereby changing the refractive index of said probe region.

58. (original) The method of claim 55 further comprising the step of flowing chemical species through said flow cell, thereby changing the thickness of said probe region.

59. (original) The method of claim 55 wherein said flow cell is a microfluidic flow cell.

60. (currently amended) A method of generating an image of a probe region comprising the steps of:

passing light from a polychromatic light source through a polarizer, thereby generating light propagating along an incident light propagation axis;

directing said light onto an optical assembly, said optical assembly comprising a dielectric layer, a dielectric sample layer and a conducting layer positioned between said dielectric layer and said dielectric sample layer, thereby generating light propagating along a reflected light propagation axis, wherein a portion of said dielectric sample layer adjacent to said conducting layer comprises said probe region;

passing said light through a selectably adjustable wavelength selector positioned in the optical path between said light source and a detector, wherein light having a distribution of transmitted wavelengths is transmitted through said selectably adjustable wavelength selector;

detecting said light having said distribution of transmitted wavelengths with said detector, ~~thereby generating said image of said probe region~~, and

tuning the center wavelength of said distribution of transmitted wavelengths by adjusting said selectably adjustable wavelength selector to transmit light having a continuously tunable distribution of wavelengths ~~selected to~~ that generates surface plasmons on a surface of said conducting layer in contact with said dielectric sample layer; thereby generating said image of said probe region.

61. (original) The method of claim 60 wherein said detector is a charge coupled device.

62. (currently amended) A method of detecting a change in the refractive index of a probe region comprising the steps of:

passing light from a polychromatic light source through a polarizer, thereby generating light propagating along an incident light propagation axis;

directing said light onto an optical assembly, said optical assembly comprising a dielectric layer, a dielectric sample layer and a conducting layer positioned between said dielectric layer and said dielectric sample layer, thereby generating light propagating along a reflected light propagation axis, wherein a portion of said dielectric sample layer adjacent to said conducting layer comprises said probe region;

passing said light through a selectably adjustable wavelength selector positioned in the optical path between said light source and a detector, wherein light having a distribution of transmitted wavelengths is transmitted through said selectably adjustable wavelength selector;

tuning the center wavelength of said distribution of transmitted wavelengths by adjusting said selectably adjustable wavelength selector to transmit light having a continuously tunable distribution of wavelengths ~~selected to~~ that generates surface plasmons on a surface of said conducting layer in contact with said dielectric sample layer;

detecting said light having said distribution of transmitted wavelengths with said detector, thereby generating at least one reference measurement,

detecting said light with said detector, thereby generating at least one analytical measurement, and

comparing said reference measurement and said analytical measurement to detect said change in the refractive index of said probe region.

63. (original) The method of claim 62 wherein said optical assembly further comprises a flow cell for introducing chemical species into said probe region.

64. (original) The method of claim 63 further comprising the step of introducing chemical species into said probe region.

65. (new) A method of sensing the refractive index of a probe region comprising the steps of:

passing light from a polychromatic light source through a polarizer, thereby generating p-polarized light or s-polarized light propagating along an incident light propagation axis;

directing said light onto an optical assembly, said optical assembly comprising a dielectric layer, a dielectric sample layer and a conducting layer positioned between said dielectric layer and said dielectric sample layer, wherein light is reflected by said optical

assembly thereby generating reflected light propagating along a reflected light propagation axis, wherein a portion of said dielectric sample layer adjacent to said conducting layer comprises said probe region;

passing said light through an optical interference filter positioned in the optical path between said light source and a detector, wherein said optical interference filter has a tilt angle with respect to said incident light propagation axis or said reflected light propagation axis selected so that that said optical interference filter transmits incident light having a distribution of wavelengths that generates surface plasmons on a surface of said conducting layer in contact with said dielectric sample layer;

detecting said reflected light using said detector, thereby measuring a first intensity of reflected light corresponding to p-polarized light and measuring a second intensity of reflected light corresponding reflected s-polarized light;

calculating an observed percent reflectivity by determining the ratio of said first intensity of reflected light to said second intensity of reflected light;

determining a correction factor by measuring the ratio of the intensity of p-polarized light transmitted by said optical interference filter to s-polarized light transmitted by said optical interference filter having said tilt angle; and

calculating a percent reflectivity corrected for polarization dependent transmission of light transmitted by said optical

interference filter by dividing said observed percent reflectivity by said correction factor, thereby sensing the refractive index of said probe region.

66. (new) The method of claim 65 further comprising the steps of: determining a plurality of correction factors corresponding to different tilt angles by measuring the ratios of the intensity of p-polarized light transmitted by said optical interference filter to s-polarized light transmitted by said optical interference filter having a plurality of tilt angles;

plotting said correction factors as a function of tilt angle, thereby generating a calibration plot;

fitting a curve to said calibration plot, thereby generating a calibration curve; and

determining said correction factor using said calibration curve.

67. (new) The method of claim 65 where said step of determining said correction factor by measuring the ratio of the intensity of p-polarized light transmitted by said optical interference filter to s-polarized light transmitted by said optical interference filter having said tilt angle is carried out by separately measuring the intensities of p-polarized light and s-polarized light passed by said interference filter in the absence of surface plasmon formation.

68. (new) A method of generating an image of a probe region comprising the steps of:

passing light from a polychromatic light source through a polarizer, thereby generating p-polarized light or s-polarized light propagating along an incident light propagation axis;

directing said light onto an optical assembly, said optical assembly comprising a dielectric layer, a dielectric sample layer and a conducting layer positioned between said dielectric layer and said dielectric sample layer, wherein light is reflected by said optical assembly thereby generating reflected light propagating along a reflected light propagation axis, wherein a portion of said dielectric sample layer adjacent to said conducting layer comprises said probe region;

passing said light through an optical interference filter positioned in the optical path between said light source and a detector, wherein said optical interference filter has a tilt angle with respect to said incident light propagation axis or said reflected light propagation axis selected so that said optical interference filter transmits incident light having a distribution of wavelengths that generates surface plasmons on a surface of said conducting layer in contact with said dielectric sample layer;

detecting said reflected light using said detector, thereby measuring a first two-dimensional distribution of reflected light intensities corresponding to p-polarized light and measuring second two-dimensional distribution of reflected light intensities corresponding to s-polarized light;

calculating a two dimensional distribution of observed percent reflectivities by determining the ratios of p-polarized reflected light

intensities in said first two-dimensional distribution to s-polarized light intensities in said second two-dimensional distributions of reflected light intensities;

determining a two-dimensional array of correction factors corresponding to said tilt angle by measuring the ratios of the intensity of p-polarized light transmitted by said optical interference filter to s-polarized light transmitted by said optical interference filter having said tilt angle for each element in said two dimensional distribution of reflected light intensities ; and

calculating a two dimensional distribution of percent reflectivities corrected for polarization dependent transmission of light transmitted by said optical interference filter by dividing said observed percent reflectivities by said correction factors in said two dimensional array, thereby generating an image of said probe region.

69. (new) The method of claim 68 further comprising the steps of: determining a plurality of two dimensional arrays of correction factors corresponding to different tilt angles by measuring the ratios of the intensity of p-polarized light transmitted by said optical interference filter to s-polarized light transmitted by said optical interference filter at a plurality of tilt angles;

plotting said correction factors as a function of tilt angle, thereby generating a plurality of calibration plots;

fitting curves to said calibration plots, thereby generating a plurality of calibration curves; and

determining said correction factors using said plurality of said calibration curves.

70. (new) The method of claim 68 further comprising the step of optimizing the contrast of said image of said probe region by varying the center wavelength of said distribution of transmitted wavelength by rotating said optical interference filter about an axis which is orthogonal to said incident light propagation axis or said reflected light propagation axis.

71. (new) The method of claim 68 where said step of determining a two-dimensional array of correction factors corresponding to said tilt angle by measuring the ratios of the intensity of p-polarized light transmitted by said optical interference filter to s-polarized light transmitted by said optical interference filter having said tilt angle for each element in said two dimensional distribution of reflected light intensities is carried out by separately measuring the intensities of p-polarized light and s-polarized light passed by said interference filter in the absence of surface plasmon formation.